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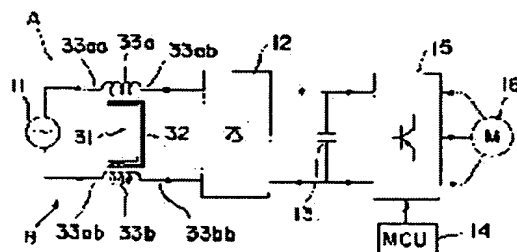
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(54) REACTOR FOR POWER SUPPLY EQUIPMENT AND INVERTER

(57)Abstract:

PROBLEM TO BE SOLVED: To suppress the noise generated on AC lines or DC lines on both sides of a simple-structured reactor or in other places, conduct a wiring work and a connection work efficiently and reduce the manufacturing cost.

SOLUTION: Between an AC power supply 11 and an AC-DC converter 12, one reactor 31 wound with two windings 33a, 33b is disposed. Out of the two windings 33a, 33b, one winding 33a is connected to one AC line A and the other winding 33b is connected to the other AC line B. Due to this structure, the noise can be suppressed by the reactor of a simple connection structure.



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CLAIMS

[Claim(s)]

[Claim 1] In the power unit which changes the alternating current of AC power supply into a direct current with an AC/DC inverter, and was made to carry out frequency conversion of this direct current with inverter equipment The reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively is arranged between AC power supply and an AC/DC inverter. The power unit characterized by connecting the 2nd coil to the alternating current line of another side while connecting the 1st coil of said reactor to one alternating current line.

[Claim 2] The power unit according to claim 1 characterized by connecting to the input side or output side of said reactor the common-mode-noise filter which looped around two coils.

[Claim 3] In the power unit which changes the alternating current of AC power supply into a direct current with an AC/DC inverter, and was made to carry out frequency conversion of this direct current with inverter equipment The reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively is arranged between an AC/DC inverter and inverter equipment. The power unit characterized by connecting the 2nd coil to the direct-current line of another side while connecting the 1st coil of said reactor to one direct-current line.

[Claim 4] The power unit according to claim 1 characterized by connecting the coil of another side to the other side of a direct-current line while arranging the reactor which consists of one iron core mold core which looped around two coils between an AC/DC inverter and inverter equipment and connecting one coil of this reactor to the one side of a direct-current line.

[Claim 5] The power unit according to claim 1 or 3 characterized by making almost the same the inductance of each coil around which a reactor is looped.

[Claim 6] The power unit according to claim 1 or 3 characterized by equipping the input side or output side of a reactor with the compulsive electrical shorting device which connects a reactor with AC power supply too hastily compulsorily.

[Claim 7] Said iron core mold core is a power unit according to claim 1 or 3 characterized by being a cylindrical mold core, EI mold core, or an annular mold core.

[Claim 8] The power unit according to claim 1 or 3 characterized by having prepared the terminal of a half coil in the 1 side of a reactor from at least two coils, and preparing the terminal of the coil of the remaining one half in a side besides a reactor.

[Claim 9] It is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. The connection of the 1st coil which connects with the AC/DC inverter for inverter equipments while the connection of the 1st coil linked to AC power supply and the 2nd coil is pulled out at the 1 side of a reactor, and the 2nd coil is pulled out at a side besides a reactor. The reactor for inverter equipments characterized by having formed the 1st coil in one alternating current line, and forming the 2nd coil in the alternating current line of another side.

[Claim 10] It is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. The connection of the 1st coil which connects with the AC/DC inverter for inverter equipments while the connection of the 1st

coil linked to the compulsive electrical shorting device which connects a reactor with AC power supply too hastily compulsorily, and the 2nd coil is pulled out at the 1 side of a reactor, and the 2nd coil is pulled out at a side besides a reactor. The reactor for inverter equipments characterized by having formed the 1st coil in one alternating current line, and forming the 2nd coil in the alternating current line of another side.

[Claim 11] It is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. While the connection of the 1st coil linked to the common-mode-noise filter which looped around two coils formed in the input side of a reactor, and the 2nd coil is pulled out at the 1 side of a reactor. The reactor for inverter equipments characterized by having pulled out the connection of the 1st coil linked to the AC/DC inverter for inverter equipments, and the 2nd coil at the side besides a reactor, having formed the 1st coil in one alternating current line, and forming the 2nd coil in the alternating current line of another side.

[Claim 12] It is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. The connection of the 1st coil linked to the common-mode-noise filter which looped around two coils formed in the output side of a reactor while the connection of the 1st coil linked to AC power supply and the 2nd coil was pulled out at the 1 side of a reactor, and the 2nd coil is pulled out at a side besides a reactor. The reactor for inverter equipments characterized by having formed the 1st coil in one alternating current line, and forming the 2nd coil in the alternating current line of another side.

[Claim 13] It is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. The connection of the 1st coil linked to the smoothing capacitor formed in the preceding paragraph of inverter equipment while the connection of the 1st coil linked to the output side of the AC/DC inverter for inverter equipments and the 2nd coil was pulled out at the 1 side of a reactor, and the 2nd coil is pulled out at a side besides a reactor. The reactor for inverter equipments characterized by forming the 1st coil in one alternating current line, and forming the 2nd coil in the alternating current line of another side.

[Claim 14] Said iron core mold core is a reactor for inverter equipments according to claim 9 to 13 characterized by being a cylindrical mold core, EI mold core, or an annular mold core.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the reactor for a power unit and inverter equipments, and it relates to the power unit which connected the coil of another side to the alternating current line of another side etc., and the reactor for inverter equipments while it connects to one alternating current line etc. one coil of the reactor which looped around two coils especially.

[0002]

[Description of the Prior Art] As shown in the power unit 10 generally used for a conditioner etc. at drawing 9 , the AC/DC inverter 12 is connected to AC power supply 11, and an alternating current is changed into a direct current.

[0003] The inverter equipment 15 controlled by the microcomputer (henceforth "MCU") 14 through a smoothing capacitor 13 is connected to this AC/DC inverter 12, and an output frequency is modulated.

[0004] A motor 16 is connected to this inverter equipment 15, and actuation control of this is carried out with the frequency modulated with inverter equipment 15.

[0005] And in this power unit 10, the coil 18 of a reactor 17 is connected to the alternating current line A of the upside between AC power supply 11 and the AC/DC inverter 12, and electromagnetic energy is conserved.

[0006] The coil 18 of this reactor 17 is coiled around core 19c of the center of EI mold cores 19a and 19b formed with silicon steel etc. as shown in drawing 10 , it connects one coil terminal 20a to terminal 11a of an AC-power-supply 11 upside, and connects coil terminal 20b of another side to terminal 12a of the AC/DC inverter 12 upside.

[0007] By the way, as control of a noise is strengthened and this kind of power unit 10 is shown in drawing 3 , the coils 18 and 28 of the separate reactors 17 and 27 are connected to the alternating current lines A and B of vertical both sides, and the noise produced on the alternating current lines A and B is controlled recently.

[0008] Thus, equipping the alternating current line of both sides with a separate reactor had the problem referred to as making high about [complicating the configuration of a power unit greatly], or its manufacturing cost.

[0009] Moreover, having a different reactor for every alternating current line of both sides had the problem referred to as doing the wiring activity and connection troublesome.

[0010] Furthermore, in a separate reactor, however it might manufacture to accuracy, the consistency of the inductance of both coils could not be taken but there was a problem referred to as newly generating a noise by this.

[0011] Therefore, the noise filter, the touch-down capacitor, etc. had to be independently formed in this power unit.

[0012] Then, it aims at offering the power unit which does the wiring activity and connection efficiently while this invention controls the noise produced by the reactor of a configuration of having been simplified on the alternating current line of both sides, or the direct-current line of both sides, and aimed at reduction of a manufacturing cost.

[0013]

[Means for Solving the Problem] In the power unit which invention of claim 1 changes the alternating current of AC power supply into a direct current with an AC/DC inverter, and was made to carry out frequency conversion of this direct current with inverter equipment Divide the 1st coil and 2nd coil into one iron core mold core respectively at two steps of upper and lower sides, and a reactor is arranged between AC power supply and an AC/DC inverter. While connecting the 1st coil of said reactor to one alternating current line, the noise produced on the alternating current line of both sides by the reactor which connected and simplified the 2nd coil on the alternating current line of another side is controlled.

[0014] Moreover, invention of claim 2 controls the noise which connects to the input side or output side of said reactor the common-mode-noise filter which looped around two coils, and is produced on the alternating current line of both sides by the common-mode-noise filter and the reactor.

[0015] Furthermore, invention of claim 3 changes the alternating current of AC power supply into a direct current with an AC/DC inverter, and sets it to the power unit which was made to carry out frequency conversion of this direct current with inverter equipment. The reactor which divided the 1st coil and 2nd coil into one iron core mold core respectively at two steps of upper and lower sides is arranged between an AC/DC inverter and inverter equipment. While connecting the 1st coil of said reactor to one direct-current line, the noise which connects the 2nd coil to the direct-current line of another side, and is produced on the direct-current line of both sides by the reactor of a simple configuration is controlled.

[0016] Furthermore, invention of claim 4 arranges the reactor which consists of one iron core mold core which looped around two coils between AC power supply and an AC/DC inverter and between an AC/DC inverter and inverter equipment. While connecting one coil of said reactor to the one side of a direct-current line, the noise which connects the coil of another side to the other side of a direct-current line, and is produced on the alternating current line and direct-current line of both sides by the reactor of a simple configuration is controlled.

[0017] Furthermore, invention of claim 5 controls the noise which makes almost the same the inductance of each coil around which a reactor is looped, and is produced on the alternating current line of both sides, the direct-current line of both sides, or the alternating current line of both sides and the direct-current line of both sides.

[0018] Furthermore, invention of claim 6 improves compulsorily the power-factor of both the alternating current line or both the direct-currents line while controlling the noise which equips the input side or output side of a reactor with the compulsive electrical shorting device which connects a reactor with AC power supply too hastily compulsorily, and is produced on both the alternating current line or both the direct-currents line.

[0019] Since said iron core mold core is a cylindrical mold core, EI mold core, or an annular mold core, invention of claim 7 of a pan can make almost the same the inductance of each coil around which the core is looped.

[0020] Furthermore, since invention of claim 8 prepared the terminal of a half coil in the 1 side of a reactor from at least two coils and prepared the terminal of the coil of the remaining one half in the side besides a reactor, it can make wiring activity of a reactor, and connection easily.

[0021] Furthermore, invention of claim 9 is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. The connection of the 1st coil which connects with the AC/DC inverter for inverter equipments while the connection of the 1st coil linked to AC power supply and the 2nd coil is pulled out at the 1 side of a reactor, and the 2nd coil is pulled out at a side besides a reactor. the 1st coil prepares in one alternating current line -- having -- the 2nd coil -- the alternating current line of another side -- preparing -- wiring activity of a reactor and connection can be made easily.

[0022] Furthermore, invention of claim 10 is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. The connection of the 1st coil which connects with the AC/DC inverter for inverter equipments while the connection of the 1st coil linked to the compulsive electrical shorting device which connects a reactor with AC power supply too hastily compulsorily, and the 2nd coil is pulled out

at the 1 side of a reactor, and the 2nd coil is pulled out at a side besides a reactor. While the 1st coil is formed in one alternating current line, and the 2nd coil is formed in the alternating current line of another side and making easily wiring activity with a reactor, a compulsive electrical shorting device, and a reactor and the AC/DC inverter for inverter equipments, and connection, the power-factor of an alternating current line is improvable.

[0023] Furthermore, invention of claim 11 is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. While the connection of the 1st coil linked to the common-mode-noise filter which looped around two coils formed in the input side of a reactor, and the 2nd coil is pulled out at the 1 side of a reactor. The connection of the 1st coil linked to the AC/DC inverter for inverter equipments and the 2nd coil is pulled out at a side besides a reactor. The 1st coil is formed in one alternating current line, and the 2nd coil is formed in the alternating current line of another side, and makes easy connection with a reactor, a common-mode-noise filter, and a reactor and the AC/DC inverter for inverter equipments.

[0024] Furthermore, invention of claim 12 is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. The connection of the 1st coil linked to the common-mode-noise filter which looped around two coils formed in the output side of a reactor while the connection of the 1st coil linked to AC power supply and the 2nd coil was pulled out at the 1 side of a reactor, and the 2nd coil is pulled out at a side besides a reactor. The 1st coil is formed in one alternating current line, and reduction of a noise can be aimed at, while the 2nd coil is formed in the alternating current line of another side and makes easy connection between a reactor, AC power supply and a reactor, and a common-mode-noise filter.

[0025] Furthermore, invention of claim 13 is the reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps of upper and lower sides respectively. The connection of the 1st coil linked to the smoothing capacitor formed in the preceding paragraph of inverter equipment as if the connection of the 1st coil linked to the output side of the AC/DC inverter for inverter equipments and the 2nd coil is pulled out at the 1 side of a reactor and the 2nd coil is pulled out at a side besides a reactor. The 1st coil is formed in one alternating current line, and while the 2nd coil is formed in the alternating current line of another side and makes easy connection between a reactor, the AC/DC inverter for inverter equipments and a reactor, and a smoothing capacitor, reduction of the noise of a direct-current line can be aimed at.

[0026] Furthermore, since said iron core mold core of invention of claim 14 was used as the cylindrical mold core, EI mold core, or the annular mold core, it can simplify the configuration of a reactor.

[0027]

[Embodiment of the Invention] The gestalt of operation of the power unit of this invention is explained with reference to an accompanying drawing.

[0028] Since the power unit 30 grade concerning this invention is fundamentally constituted almost like the conventional power unit 10, the same part as the conventional power unit 10 attaches the same sign, omits detailed explanation and explains it.

[0029] First, the gestalt of operation of the 1st of the power unit 30 built over this invention by drawing 1 and drawing 2 is explained.

[0030] As it is used for a conditioner and shown in the alternating current lines A and B by the side of the upper and lower sides of AC power supply 11 at drawing 2, two coils 33a and 33b which divided into two steps of upper and lower sides, and were coiled around one reactor 31 are connected, and this power unit 30 controls the noise of the alternating current lines A and B of both sides.

[0031] This reactor 31 was constituted by I-beam core 32a, such as silicon steel, and E mold core 32b, and equips core 32c of this core with two coils 33a and 33b divided and coiled around two steps of upper and lower sides.

[0032] Although not illustrated between core 32c of this core, and I-beam core 32a, the gap (air gap) is formed, and 1st coil 33a, such as the same ingredient and the same number of turns, and

2nd 33b are wound around these cores 32, and it is made to make that inductance almost the same.

[0033] Terminal 33aa which is the connection of 1st coil 33a, and 33ab are pulled out at the 1 side (left-hand side) of a reactor 31, and terminal 33ba which is the connection of 2nd coil 33b, and 33bb are pulled out at the side (right-hand side) besides a reactor 31, and when connecting with the alternating current line [on the other hand / (above)] A and the alternating current line B of another side (below), it can connect with the AC/DC inverter 12 equipped with a rectifier circuit easily.

[0034] The inverter equipment 15 controlled by MCU14 through a smoothing capacitor 13 is connected to the output side of this AC/DC inverter 12, the frequency which this changed is given to the motor 16 for compressors, and actuation control of this is carried out.

[0035] The constituted power unit 30 Thus, 1st coil 33 from AC power supply 11 a, 2nd coil 33 from alternating current and AC power supply 11 b which results in AC power supply 11 through the AC/DC inverter 12 and 2nd coil 33b, The AC/DC inverter 12 and the inductance to the alternating current which results in AC power supply 11 through 1st coil 33a are almost the same. Since 1st coil 33a of a reactor 31 and 2nd coil 33b are inserted in both alternating current lines, the noise which can block the switching noise of inverter equipment 15 substantially, and is ****(ed) by AC power supply 11 can be controlled.

[0036] Moreover, since a noise is controlled, conversion efficiency which changes an alternating current into a direct current, conversion which changes a direct current into the alternating current of arbitration can be performed exactly.

[0037] Furthermore, since what is necessary is just to connect with both alternating current lines A and B by one reactor 31 which has two coils of 1st coil 33a of the same inductance, and 2nd coil 33b, the configuration of a reactor is simplified and reduction of a manufacturing cost is possible.

[0038] As shown in drawing 3, the noise of the low frequency field of the power unit 30 of this invention has improved remarkably the noise figure of the power unit 30 of this invention, and the conventional power unit 10 compared with the conventional power unit 10.

[0039] Below, drawing 4 explains the gestalt of operation of the 2nd of this invention.

[0040] In the power unit 40 of the gestalt of this operation, the common-mode-noise filter 41 with a mutual induction coil is further connected between the reactors 31 and AC power supply 11 which were shown in drawing 1.

[0041] That is, a noise is controlled in multiplication by the reactor 31 which divided and looped respectively around two coils 33a and 33b the common-mode-noise filter 41 and one iron core mold core 32 which consist of coil 41a prepared in one side of the alternating current lines A and B, and coil 41b prepared in another side of the alternating current lines A and B to two steps.

[0042] Thus, the noise of both the alternating current lines A and B can be remarkably controlled by constituting.

[0043] Moreover, with this operation gestalt, in order to use as a power unit 40 of a conditioner, MCU44 which performs control of relay 41j and 41f of drive circuits of 41f of drive circuits which drive valve 41i of the common-mode-noise filter 41 and a conditioner, and 41f of drive circuits by 41h of temperature sensors was formed in same substrate 45a, and the AC/DC inverter 12, the smooth diode 13, and inverter equipment 15 are formed in same substrate 45b.

[0044] Furthermore, terminal 33aa of a reactor 31, terminal 45aa linked to 33ab, and 45ab are prepared in the flank of the output side of this substrate 45a, and terminal 33ba of a reactor 31, terminal 45ba connected at 33bb, and 45bb are prepared in the flank of the input side of substrate 45b, and it has come to be able to perform connection between substrate 45a and the input section of rear KUTATO 31, and connection between substrate 45b and the output section of a reactor 31.

[0045] Thereby, a wiring activity with a reactor 31 and other devices and connection can be simplified.

[0046] Below, drawing 5 explains the gestalt of operation of the 3rd of this invention.

[0047] The diode bridge 52 which has the switching elements 51, such as IGBT, between a reactor 31 and the AC/DC inverter 12 is connected to the power unit 50 of the gestalt of this

operation, by carrying out predetermined time ON of the switching element 51, using the zero crossing point of AC power supply 11 as timing, a reactor 31 and AC-power-supply 11 grade are short-circuited compulsorily, and the power-factor of input power is improved.

[0048] Thus, even when short-circuiting a reactor 31 and AC power supply 11 compulsorily, it controls that the switching noise of a switching element 51 transmits to an AC-power-supply side by 1st coil 33a of a reactor 31, and 2nd coil 33b.

[0049] Below, drawing 6 explains the gestalt of operation of the 4th of this invention.

[0050] A reactor 31 is connected and formed between the AC/DC inverter 12 and inverter equipment 15 at the power unit 60 of the gestalt of this operation, and the noise of the direct-current lines D and E of the both sides which changed the alternating current into the direct current is controlled.

[0051] the noise on the direct-current lines D and E produced when this changes an alternating current into a direct current -- controlling -- while -- inverter equipment 15 -- frequency conversion etc. is exactly convertible.

[0052] Below, drawing 7 explains the gestalt of operation of the 7th of this invention.

[0053] The diode bridge 72 which has the switching elements 71, such as IGBT, between a reactor 31 and inverter equipment 15 like drawing 5 is connected to the power unit 70 of the gestalt of this operation, by turning on a switching element 71 to predetermined timing, RIAKU ** 31 and the AC/DC inverter 12 short-circuit, and the power-factor of input power is improved.

[0054] It can control that the switching noise of a switching element 71 transmits to the AC/DC inverter 12 side by 1st coil 33a of a diode bridge 72 and a reactor 31, and 2nd coil 33b by this short circuit.

[0055] In addition, with the gestalt of each above-mentioned implementation, although EI mold core 32 was used for the reactor 31, the reactor 81 of the annular mold core 82 as shown in drawing 8 instead of this may be used.

[0056] If it does in this way, while it is separable between terminal 83aa [of coil 82a], 83ba, terminal 83ab [of coil 83b], and 83bb upsides and the bottoms which are wound around the annular mold core 82, wiring activity of a power unit and connection can be made easily.

[0057] Although not furthermore illustrated, even if it forms the core 32 of a reactor 31 with a cylindrical mold core, control of a noise can be aimed at almost similarly.

[0058] Furthermore, although the coil of a reactor used what was divided into two, it is divided into four and six, chooses two or more of these coils suitably, and you may make it connect them.

[0059] Furthermore, whether it prepares this in an output side although the input side of the reactor of an alternating current line prepared the common-mode-noise filter, or it prepares a common-mode-noise filter in the input side or output side of a reactor of a direct-current line, a noise can be similarly controlled in multiplication with a reactor.

[0060] In addition, although the reactor was independently prepared in the alternating current line or the direct-current line, reduction of a noise can be aimed at still more effectively by preparing in both lines.

[0061]

[Effect of the Invention] In the power unit which this invention changes the alternating current of AC power supply into a direct current with an AC/DC inverter, and was made to carry out frequency conversion of this direct current with inverter equipment The reactor which divided and looped one iron core mold core around the 1st coil and 2nd coil to two steps up and down respectively is prepared in AC-power-supply equipment. The noise produced on the alternating current line or direct-current line of both sides in the reactor of a simple connection configuration can be controlled by having connected the 1st coil of said reactor to one side and another side of an alternating current line or a direct-current line respectively.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The circuit diagram showing the outline of the gestalt of operation of the 1st of this invention.

[Drawing 2] The perspective view of the reactor used for the power unit of drawing 1 .

[Drawing 3] The characteristic curve sheet of the noise to the frequency of the power unit of this invention, and the conventional power unit.

[Drawing 4] The circuit diagram showing the outline of the gestalt of operation of the 2nd of this invention.

[Drawing 5] The circuit diagram showing the outline of the gestalt of operation of the 3rd of this invention.

[Drawing 6] The circuit diagram showing the outline of the gestalt of operation of the 4th of this invention.

[Drawing 7] The circuit diagram showing the outline of the gestalt of operation of the 5th of this invention.

[Drawing 8] It is a top view about the outline of other reactors used for the power unit of this invention.

[Drawing 9] The circuit diagram showing the outline of the conventional power unit.

[Drawing 10] The perspective view of the conventional reactor used for the power unit of drawing 9 .

[Drawing 11] It is a top view about other outlines of the conventional power unit.

[Description of Notations]

10, 30, 40, 50, 60, 70 Power unit

11 AC Power Supply

12 AC/DC Inverter

13 Smoothing Capacitor

14 Microcomputer (MCU)

15 Inverter Equipment

16 Motor

17, 27, 31, 81 Reactor

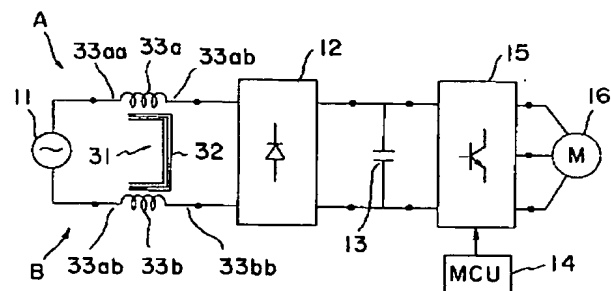
18, 28, 33a, 33b Coil

20a, 20b Terminal

41 Common-Mode-Noise Filter

52 72 Diode bridge

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【特許請求の範囲】

【請求項1】交流電源の交流を交直変換装置により直流に変換し、この直流をインバータ装置により周波数変換するようにした電源装置において、

1つの鉄芯型コアに第1の巻線および第2の巻線を各々上下2段に分割して巻装したリアクタを交流電源と交直変換装置との間に配置させ、前記リアクタの第1の巻線を一方の交流ラインに接続するとともに第2の巻線を他方の交流ラインに接続したことを特徴とする電源装置。

【請求項2】前記リアクタの入力側あるいは出力側には2つの巻線を巻装したコモンモードノイズフィルタを接続したことを特徴とする請求項1記載の電源装置。

【請求項3】交流電源の交流を交直変換装置により直流に変換し、この直流をインバータ装置により周波数変換するようにした電源装置において、

1つの鉄芯型コアに第1の巻線および第2の巻線を各々上下2段に分割して巻装したリアクタを交直変換装置とインバータ装置との間に配置させ、前記リアクタの第1の巻線を一方の直流ラインに接続するとともに第2の巻線を他方の直流ラインに接続したことを特徴とする電源装置。

【請求項4】交直変換装置とインバータ装置との間に2つの巻線を巻装した1つの鉄芯型コアからなるリアクタを配置させ、このリアクタの一方の巻線を直流ラインの一方側に接続するとともに他方の巻線を直流ラインの他方側に接続したことを特徴とする請求項1記載の電源装置。

【請求項5】リアクタに巻装される各々の巻線のインダクタンスをほぼ同一にしたことを特徴とする請求項1または3記載の電源装置。

【請求項6】リアクタの入力側あるいは出力側に交流電源とリアクタを強制的に短絡する強制短絡装置を備えたことを特徴とする請求項1または3記載の電源装置。

【請求項7】前記鉄芯型コアは棒状型コア、EI型コアあるいは環状型コアであることを特徴とする請求項1または3記載の電源装置。

【請求項8】少なくとも2つの巻線から半分の巻線の端子をリアクタの一侧に設け、残りの半分の巻線の端子をリアクタの他側に設けたことを特徴とする請求項1または3記載の電源装置。

【請求項9】1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下2段に分割して巻装したリアクタであって、交流電源に接続する第1の巻線および第2の巻線の接続部がリアクタの一侧に引き出されるとともにインバータ装置用交直変換装置に接続する第1の巻線および第2の巻線の接続部がリアクタの他側に引き出され、第1の巻線が一方の交流ラインに設けられ、第2の巻線が他方の交流ラインに設けられたことを特徴とするインバータ装置用リアクタ。

【請求項10】1つの鉄芯型コアに第1の巻線と第2の

10 【請求項11】1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下2段に分割して巻装したリアクタであって、リアクタの入力側に設けられた2つの巻線を巻装したコモンモードノイズフィルタに接続する第1の巻線および第2の巻線の接続部がリアクタの一侧に引き出されるとともにインバータ装置用交直変換装置に接続する第1の巻線および第2の巻線の接続部がリアクタの他側に引き出され、第1の巻線が一方の交流ラインに設けられ、第2の巻線が他方の交流ラインに設けられたことを特徴とするインバータ装置用リアクタ。

20 【請求項12】1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下2段に分割して巻装したリアクタであって、交流電源に接続する第1の巻線および第2の巻線の接続部がリアクタの一侧に引き出されるとともにリアクタの出力側に設けられた2つの巻線を巻装したコモンモードノイズフィルタに接続する第1の巻線および第2の巻線の接続部がリアクタの他側に引き出され、第1の巻線が一方の交流ラインに設けられ、第2の巻線が他方の交流ラインに設けられたことを特徴とするインバータ装置用リアクタ。

30 【請求項13】1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下2段に分割して巻装したリアクタであって、インバータ装置用交直変換装置の出力側に接続する第1の巻線および第2の巻線の接続部がリアクタの一侧に引き出されるとともにインバータ装置の前段に設けられた平滑コンデンサに接続する第1の巻線および第2の巻線の接続部がリアクタの他側に引き出され、第1の巻線が一方の交流ラインに設けられ、第2の巻線が他方の交流ラインに設けられることを特徴とするインバータ装置用リアクタ。

40 【請求項14】前記鉄芯型コアは棒状型コア、EI型コアあるいは環状型コアであることを特徴とする請求項9乃至13のいずれかに記載のインバータ装置用リアクタ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は電源装置およびインバータ装置用リアクタに係り、特に、2つの巻線を巻装したリアクタの一方の巻線を一方の交流ライン等に接続するとともに他方の巻線を他方の交流ライン等に接続するようにした電源装置およびインバータ装置用リアクタに関する。

【0002】

【従来の技術および発明が解決しようとする課題】一般に空気調和装置等に用いられる電源装置10には図9に示すように交流電源11に交直変換装置12が接続され、交流を直流に変換するようになっている。

【0003】この交直変換装置12には平滑コンデンサ13を介しマイクロコンピュータ（以下「MCU」と言う）14により制御されるインバータ装置15が接続され、出力周波数を変調するようになっている。

【0004】このインバータ装置15にはモータ16が接続され、これをインバータ装置15で変調した周波数により駆動制御するようになっている。

【0005】そして、この電源装置10では交流電源11と交直変換装置12との間の上側の交流ラインAにはリアクタ17の巻線18が接続され、電磁エネルギーを蓄えるようになっている。

【0006】このリアクタ17の巻線18は図10に示すように珪素鋼板等により形成したEI型コア19a、19bの中央のコア19cに巻かれ、一方の巻線端子20aを交流電源11の上側の端子11aに接続し、他方の巻線端子20bを交直変換装置12の上側の端子12aに接続するようになっている。

【0007】ところで、最近、この種の電源装置10はノイズの抑制が強化され、図3に示すように上下両側の交流ラインA、Bに別々のリアクタ17、27の巻線18、28が接続され、交流ラインA、Bに生じるノイズが抑制されるようになっている。

【0008】このように両側の交流ラインに別々のリアクタを備えることは電源装置の構成を大きく、かつ、複雑にするばかりかその製造コストを高くすると言う問題があった。

【0009】また、両側の交流ライン毎に異なるリアクタを備えることはその配線作業や接続作業を面倒にすると言う問題があった。

【0010】さらに、別々のリアクタでは如何に正確に製造しても両巻線のインダクタンスの整合性が取れずこれにより新たにノイズを発生させると言う問題があった。

【0011】そのため、この電源装置には別にノイズフィルタや接地コンデンサ等を設けなければならなかった。

【0012】そこで本発明は簡易化した構成のリアクタにより両側の交流ラインあるいは両側の直流ライン等に生じるノイズを抑制するとともにその配線作業や接続作業を効率的に行い、かつ、製造コストの低減を図るようにした電源装置を提供することを目的とするものである。

【0013】

【課題を解決するための手段】請求項1の発明は交流電源の交流を交直変換装置により直流に変換しこの直流を

インバータ装置により周波数変換するようにした電源装置において、1つの鉄芯型コアに第1の巻線および第2の巻線を各々上下2段に分割してリアクタを交流電源と交直変換装置との間に配置させ、前記リアクタの第1の巻線を一方の交流ラインに接続するとともに第2の巻線を他方の交流ラインに接続し簡易化したリアクタにより両側の交流ラインに生じるノイズを抑制するようにしたものである。

【0014】また、請求項2の発明は前記リアクタの入力側あるいは出力側には2つの巻線を巻装した共通モードノイズフィルタを接続し両側の交流ラインに生じるノイズを共通モードノイズフィルタおよびリアクタにより抑制するようにしたものである。

【0015】さらに、請求項3の発明は交流電源の交流を交直変換装置により直流に変換し、この直流をインバータ装置により周波数変換するようにした電源装置において、1つの鉄芯型コアに第1の巻線および第2の巻線を各々上下2段に分割したリアクタを交直変換装置とインバータ装置との間に配置させ、前記リアクタの第1の巻線を一方の直流ラインに接続するとともに第2の巻線を他方の直流ラインに接続し簡易な構成のリアクタにより両側の直流ラインに生じるノイズを抑制するようにしたものである。

【0016】さらに、請求項4の発明は交流電源と交直変換装置との間および交直変換装置とインバータ装置との間に2つの巻線を巻装した1つの鉄芯型コアからなるリアクタを配置させ、前記リアクタの一方の巻線を直流ラインの一方側に接続するとともに他方の巻線を直流ラインの他方側に接続し簡易な構成のリアクタにより両側の交流ラインおよび直流ラインに生じるノイズを抑制するようにしたものである。

【0017】さらに、請求項5の発明はリアクタに巻装される各々の巻線のインダクタンスをほぼ同一にし両側の交流ライン、両側の直流ラインあるいは両側の交流ラインと両側の直流ラインに生じるノイズを抑制するようにしたものである。

【0018】さらに、請求項6の発明はリアクタの入力側あるいは出力側に交流電源とリアクタを強制的に短絡する強制短絡装置を備え両交流ラインあるいは両直流ラインに生じるノイズを抑制するとともに両交流ラインあるいは両直流ラインの力率を強制的に改善するようにしたものである。

【0019】さらに、請求項7の発明は前記鉄芯型コアは棒状型コア、EI型コアあるいは環状型コアであるから、そのコアに巻装する各巻線のインダクタンスをほぼ同一にすることができる。

【0020】さらに、請求項8の発明は少なくとも2つの巻線から半分の巻線の端子をリアクタの一侧に設け、残りの半分の巻線の端子をリアクタの他側に設けたからリアクタの配線作業、接続作業を容易に行うことができ

る。

【0021】さらに、請求項9の発明は1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下2段に分割して巻装したリアクタであって、交流電源に接続する第1の巻線および第2の巻線の接続部がリアクタの一侧に引き出されるとともにインバータ装置用交直変換装置に接続する第1の巻線および第2の巻線の接続部がリアクタの他側に引き出され、第1の巻線が一方の交流ラインに設けられ、第2の巻線が他方の交流ラインに設けられリアクタの配線作業、接続作業を容易に行うことができる。

【0022】さらに、請求項10の発明は1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下2段に分割して巻装したリアクタであって、交流電源とリアクタを強制的に短絡する強制短絡装置に接続する第1の巻線および第2の巻線の接続部がリアクタの一侧に引き出されるとともにインバータ装置用交直変換装置に接続する第1の巻線および第2の巻線の接続部がリアクタの他側に引き出され、第1の巻線が一方の交流ラインに設けられ、第2の巻線が他方の交流ラインに設けられリアクタと強制短絡装置およびリアクタとインバータ装置用交直変換装置との配線作業、接続作業を容易に行うとともに交流ラインの力率を改善することができる。

【0023】さらに、請求項11の発明は1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下2段に分割して巻装したリアクタであって、リアクタの入力側に設けられた2つの巻線を巻装したコモンモードノイズフィルタに接続する第1の巻線および第2の巻線の接続部がリアクタの一侧に引き出されるとともにインバータ装置用交直変換装置に接続する第1の巻線および第2の巻線の接続部がリアクタの他側に引き出され、第1の巻線が一方の交流ラインに設けられ、第2の巻線が他方の交流ラインに設けられリアクタとコモンモードノイズフィルタおよびリアクタとインバータ装置用交直変換装置との接続を容易にする。

【0024】さらに、請求項12の発明は1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下2段に分割して巻装したリアクタであって、交流電源に接続する第1の巻線および第2の巻線の接続部がリアクタの一侧に引き出されるとともにリアクタの出力側に設けられた2つの巻線を巻装したコモンモードノイズフィルタに接続する第1の巻線および第2の巻線の接続部がリアクタの他側に引き出され、第1の巻線が一方の交流ラインに設けられ、第2の巻線が他方の交流ラインに設けられリアクタと交流電源およびリアクタとコモンモードノイズフィルタとの接続を容易にするとともにノイズの低減を図ることができる。

【0025】さらに、請求項13の発明は1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下2段に分割して巻装したリアクタであって、インバータ装置用交直変換装置の出力側に接続する第1の巻線および第2の巻線

の接続部がリアクタの一侧に引き出されるとインバータ装置の前段に設けられた平滑コンデンサに接続する第1の巻線および第2の巻線の接続部がリアクタの他側に引き出され、第1の巻線が一方の交流ラインに設けられ、第2の巻線が他方の交流ラインに設けられリアクタとインバータ装置用交直変換装置およびリアクタと平滑コンデンサとの接続を容易にするとともに直流ラインのノイズの低減を図ることができる。

【0026】さらに、請求項14の発明の前記鉄芯型コアは棒状型コア、EI型コアあるいは環状型コアとしたからリアクタの構成が簡易化できる。

【0027】

【発明の実施の形態】本発明の電源装置の実施の形態を添付図面を参照して説明する。

【0028】本発明に係る電源装置30等は基本的に従来の電源装置10とほぼ同様に構成されているので従来の電源装置10と同一部分は同一符号を付し詳細な説明を省略して説明する。

【0029】まず、図1、図2により本発明に係る電源装置30の第1の実施の形態を説明する。

【0030】この電源装置30は空気調和装置に用いられるものであり交流電源11の上下側の交流ラインA、Bには図2に示すように1つのリアクタ31に上下2段に分割して巻かれた2つの巻線33a、33bが接続され、両側の交流ラインA、Bのノイズを抑制するようになっている。

【0031】このリアクタ31は珪素鋼板等のI型コア32aとE型コア32bにより構成され、この中心部のコア32cには上下2段に分割して巻いた2つの巻線33a、33bを備えている。

【0032】この中心部のコア32cとI型コア32aとの間には図示しないが間隙（エアギャップ）が形成されており、これらコア32に同一材料、同一巻数等の第1の巻線33aと第2の33bとを巻きそのインダクタンスをほぼ同一にしている。

【0033】第1の巻線33aの接続部である端子33a、33abはリアクタ31の一侧（左側）に引き出されており、また、第2の巻線33bの接続部である端子33ba、33bbはリアクタ31の他側（右側）に引き出されており、一方（上側）の交流ラインA、他方（下側）の交流ラインBに接続するときおよび整流回路を備える交直変換装置12に容易に接続できるようになっている。

【0034】この交直変換装置12の出力側には平滑コンデンサ13を介してMCU14により制御されるインバータ装置15が接続され、これにより変換した周波数を圧縮機用のモータ16に与えこれを駆動制御するようになっている。

【0035】このように構成した電源装置30は交流電源11から第1の巻線33a、交直変換装置12、第2

の巻線33bを介して交流電源11に至る交流と交流電源11から第2の巻線33b、交直変換装置12、第1の巻線33aを介して交流電源11に至る交流に対するインダクタンスがほぼ同一であり、交流ラインの両方にリアクタ31の第1の巻線33aと第2の巻線33bを挿入しているのでインバータ装置15のスイッチングノイズを大幅にブロックでき交流電源11に伝播されるノイズを抑制することができる。

【0036】また、ノイズが抑制されるから交流を直流に変換する変換効率、直流を任意の交流に変換する変換等を的確に行うことができる。

【0037】さらに、同一のインダクタンスの第1の巻線33aと第2の巻線33bとの2つの巻線を有する1つのリアクタ31により両方の交流ラインA、Bに接続するだけでよからリアクタの構成を簡易化し製造コストの低減が可能である。

【0038】この本発明の電源装置30と従来の電源装置10とのノイズ特性は図3に示すように本発明の電源装置30の低周波領域のノイズが従来の電源装置10に比べ著しく改善することができた。

【0039】つぎに、図4により本発明の第2の実施の形態を説明する。

【0040】この実施の形態の電源装置40では図1に示したリアクタ31と交流電源11との間にさらに相互誘導コイルによるコモンモードノイズフィルタ41を接続したものである。

【0041】すなわち、交流ラインA、Bの一方に設けられた巻線41aと交流ラインA、Bの他方に設けられた巻線41bとからなるコモンモードノイズフィルタ41と1つの鉄芯型コア32に2つの巻線33a、33bを各々2段に分割して巻装したリアクタ31とにより相乗的にノイズを抑制するようにしたものである。

【0042】このように構成することにより両交流ラインA、Bのノイズを著しく抑制することができる。

【0043】また、本実施形態では空気調和装置の電源装置40として用いるためにコモンモードノイズフィルタ41と空気調和装置の弁41iを駆動するドライブ回路41fとドライブ回路41fのリレー41jとドライブ回路41fの制御を温度センサ41hにより行うMCU44とを同一基板45aに設け、また、交直変換装置12、平滑ダイオード13、インバータ装置15を同一基板45bに設けている。

【0044】さらに、この基板45aの出力側の側部にリアクタ31の端子33aa、33abに接続する端子45aa、45abを設け、また、基板45bの入力側の側部にリアクタ31の端子33ba、33bbに接続する端子45ba、45bbを設け、基板45aとリアクタ31の入力部との接続および基板45bとリアクタ31の出力部との接続ができるようになっている。

【0045】これによりリアクタ31と他の機器との配

線作業、接続作業を簡易化することができる。

【0046】つぎに、図5により本発明の第3の実施の形態を説明する。

【0047】この実施の形態の電源装置50にはリアクタ31と交直変換装置12との間にIGBT等のスイッチング素子51を有するダイオードブリッジ52が接続され、スイッチング素子51を交流電源11のゼロクロス点をタイミングとして所定時間オンすることによりリアクタ31、交流電源11等を強制的に短絡し入力電源の力率を改善するようにしたものである。

【0048】このように強制的にリアクタ31と交流電源11を短絡する場合でもリアクタ31の第1の巻線33aと第2の巻線33bとにより、スイッチング素子51のスイッチングノイズが交流電源側に伝達するのを抑制する。

【0049】つぎに、図6により本発明の第4の実施の形態を説明する。

【0050】この実施の形態の電源装置60にはリアクタ31が交直変換装置12とインバータ装置15との間に接続して設けられ、交流を直流に変換した両側の直流ラインD、Eのノイズを抑制するようにしたものである。

【0051】これにより交流を直流に変換したときに生じる直流ラインD、E上のノイズの抑制するとともにインバータ装置15の周波数変換等の変換を的確に行うことができる。

【0052】つぎに、図7により本発明の第7の実施の形態を説明する。

【0053】この実施の形態の電源装置70には図5と同様にリアクタ31とインバータ装置15との間にIGBT等のスイッチング素子71を有するダイオードブリッジ72が接続され、スイッチング素子71を所定のタイミングでオンすることによりリアクタ31、交直変換装置12が短絡され入力電源の力率を改善するようにしたものである。

【0054】この短絡によりダイオードブリッジ72、リアクタ31の第1の巻線33aと第2の巻線33bによりスイッチング素子71のスイッチングノイズが交直変換装置12側に伝達するのを抑制することができる。

【0055】なお、上記各実施の形態ではリアクタ31にはE型コア32を使用したのがこれに代わり図8に示すような環状型コア82のリアクタ81を使用してもよい。

【0056】このようにすると環状型コア82に巻く巻線82aの端子83aa、83ba、巻線83bの端子83ab、83bbの上側と下側との間に分離できるとともに電源装置の配線作業、接続作業を容易に行うことができる。

【0057】さらに図示しないがリアクタ31のコア32を棒状型コアにより形成してもほぼ同様にノイズの抑制を図ることができる。

【0058】さらに、リアクタの巻線は2つに分割したものを4つ、6つに分割しこれらの複数の巻線を適宜選択して接続するようにしてもよい。

【0059】さらに、コモンモードノイズフィルタを交流ラインのリアクタの入力側が設けたがこれを出力側に設けても、また、コモンモードノイズフィルタを直流ラインのリアクタの入力側あるいは出力側に設けても同様にノイズをリアクタとともに相乗的に抑制することができる。

【0060】その他リアクタを交流ラインあるいは直流ラインに別々に設けたが双方のラインに設けることによりさらに効果的にノイズの低減をはかることができる。

【0061】

【発明の効果】本発明は交流電源の交流を交直変換装置により直流に変換し、この直流をインバータ装置により周波数変換するようにした電源装置において、1つの鉄芯型コアに第1の巻線と第2の巻線を各々上下に2段に分割して巻装したリアクタを交流電源装置に設け、前記リアクタの第1の巻線を交流ラインあるいは直流ラインの一方と他方に各々接続したことにより簡易な接続構成のリアクタで両側の交流ラインまたは直流ラインに生じるノイズを抑制することができる。

【図面の簡単な説明】

【図1】本発明の第1の実施の形態の概要を示す回路図。

【図2】図1の電源装置に使用するリアクタの斜視図。

【図3】本発明の電源装置および従来の電源装置の周波数に対するノイズの特性曲線図。

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*【図4】本発明の第2の実施の形態の概要を示す回路図。

【図5】本発明の第3の実施の形態の概要を示す回路図。

【図6】本発明の第4の実施の形態の概要を示す回路図。

【図7】本発明の第5の実施の形態の概要を示す回路図。

【図8】本発明の電源装置に使用する他のリアクタの概要を平面図。

【図9】従来の電源装置の概要を示す回路図。

【図10】図9の電源装置に使用する従来のリアクタの斜視図。

【図11】従来の電源装置の他の概要を平面図。

【符号の説明】

10、30、40、50、60、70 電源装置

11 交流電源

12 交直変換装置

13 平滑コンデンサ

14 マイクロコンピュータ (MCU)

15 インバータ装置

16 モータ

17、27、31、81 リアクタ

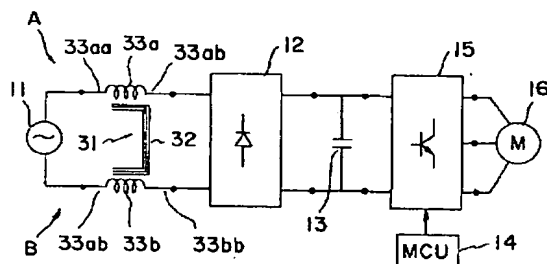
18、28、33a、33b 巻線

20a、20b 端子

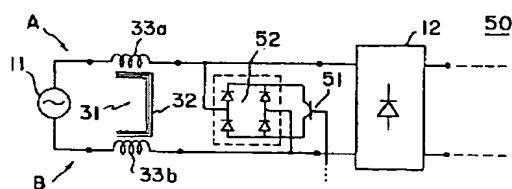
41 コモンモードノイズフィルタ

52、72 ダイオードブリッジ

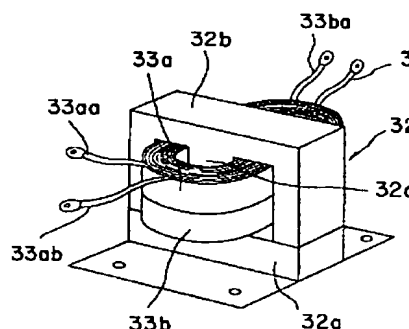
【図1】



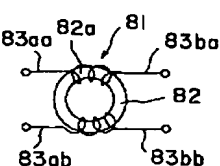
【図5】



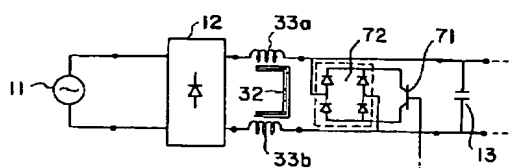
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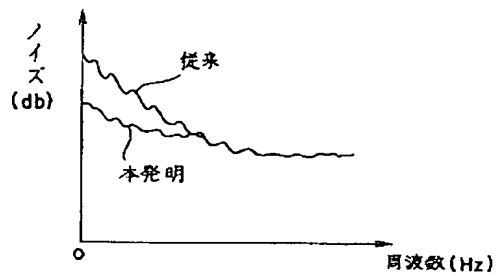
【図8】



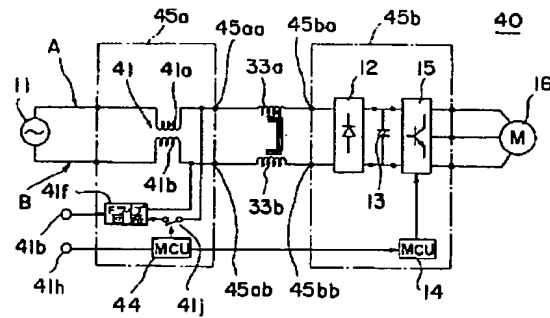
【図7】



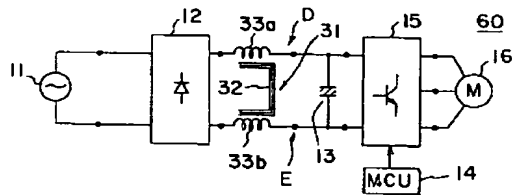
【図3】



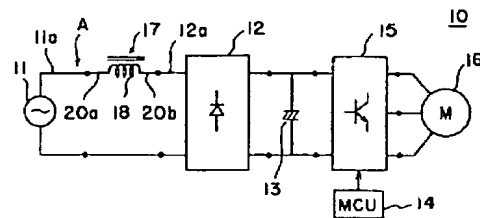
【図4】



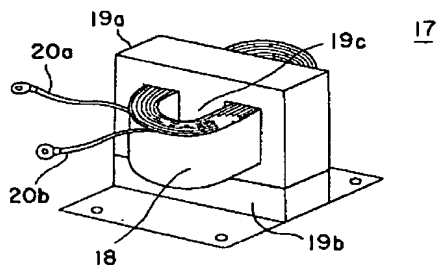
【図6】



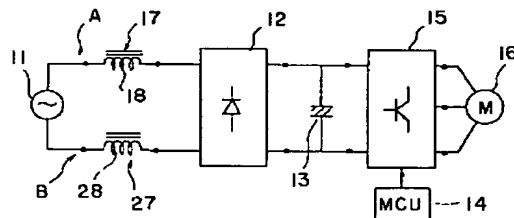
【図9】



【図10】



【図11】



フロントページの続き

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